

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : TOSHIBA CORP

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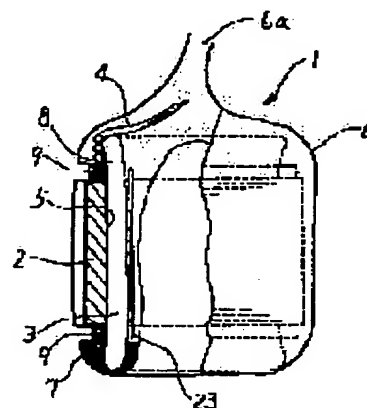
(54) METHOD FOR IMPREGNATING ELECTRIC APPARATUS WITH VARNISH

(57)Abstract:

PURPOSE: To provide the method for impregnating an electric apparatus with varnish, which prevents the formation of extra varnish at the outlet of the slot of a stator core at the inner diameter side and prevents the intrusion of the varnish from the connecting part of a lead cable when the varnish is impregnated in the pressure reduced state in the so-called a vacuum packing method and a degassing method, by which the varnish is impregnated under the state wherein the stator is covered with an airtight bag.

CONSTITUTION: In a method for impregnating an electric apparatus with varnish, a stator comprising an iron core 2 and a winding 3, which is provided on the iron core 2, is covered with an airtight bag 6.

Then, the pressure in the bag is reduced. Varnish 7 contained in the bag is made to impregnate into the stator under this pressure reduced state. In this impregnating method, self-fusing and-fixing insulator is wound around the entire connecting part of a coil-end part 8 and a lead cable 4 before the winding body is covered with the bag. Specified insulator is made to cover the upper part thereof and fixed to the coil-end part 8. Insulating paper 23 for preventing the attachment of the extra varnish is inserted and fixed at the slot-outlet part of the stator core 2 on the inner diameter side. The varnish 7 contained in the bag is impregnated into the winding body.



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CLAIMS

[Claim(s)]

[Claim 1] The coil object which consists of a coil formed in an iron core and this iron core is covered by airtight *****. It is the approach decompress [approach] the inside of that bag after this, and it was made to infiltrate into said coil object this varnish held in said bag in the state of reduced pressure. Insertion arrangement of the piece section of an insulation of the insulating paper which has the piece section of an insulation in which the good cut slot of the detachability over a varnish entered said coil object before the wrap with the bag to said stator-core bore side and the both ends between the bag bore sections is carried out. The varnish sinking-in approach of the electrical machinery and apparatus which is made to carry out heat hardening of the varnish with which it sank in into the coil and the slot after said bag covers a coil object and decompresses the inside of a bag, and is characterized by forming so that a varnish may stick to a stator-core both-sides end face and the slot outlet section.

[Claim 2] The varnish sinking-in approach of the electrical machinery and apparatus according to claim 1 which covers the insulating material of a self welding property with a predetermined insulating material winding and on it, and carries out sinking-in processing of the whole connection of an end-winding tail and a ***** cable line.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the varnish sinking-in approach of an electrical machinery and apparatus of having improved the approach of varnish treated for the coil object of the stator core of a dynamo-electric machine.

[0002]

[Description of the Prior Art] In the electrical machinery and apparatus, for example, a dynamo-electric machine, stator varnish sinking-in processing which comes to loop around an iron core a coil is performed, and aiming at the insulation of a stator, heat-resistant improvement, improvement in reinforcement, etc. is performed. By the former, the dip coating to which that stator is held in a heating furnace and heat hardening of the varnish is carried out, the dropping sinking-in method which is made to trickle a varnish to a stator and is infiltrated were used as this kind of a varnish sinking-in art after being immersed in the varnish which consists a stator of thermosetting resin.

[0003] However, by these sinking-in approaches, there was a fault of being in the varnish with which it was hard for a varnish to sink into the narrow parts between the strands of a coil, between a coil and a slot, etc., and moreover once sank in flowing out from a stator. In order to solve this problem, it was made the approach of replacing with the conventional varnish sinking-in approach, and the stator was covered with the airtight bag, where the inside of a bag is decompressed after holding a varnish in this bag, the approach of sinking the varnish in a bag into a stator was developed, and it has applied by Japanese Patent Application No. No. 231051 [two to]. This approach is described below with reference to drawing 10 thru/or drawing 14 R> 4.

[0004] The stator 1 of a dynamo-electric machine loops a stator core 2 around a coil 3, is constituted, and it holds the varnish 7 of requirements in the bag 6 while being covered, making and holding, as the inside-and-outside periphery of a stator 1 shows drawing 12 by turning up the bag 10 of the shape of a cylinder which has the airtightness shown in drawing 10 to the inside upper part. This back, by connecting opening of said bag 6 to a vacuum pump, and decompressing the interior in a bag 6, as shown in drawing 11 , a bag 6 is stuck to the inside-and-outside peripheral surface of a stator 1, and the internal varnish 7 is infiltrated into a stator 1. Then, where a stator 1 is covered from a bag 6, it heats within a heating furnace, and a varnish 7 is stiffened.

[0005]

[Problem(s) to be Solved by the Invention] Since according to the approach mentioned above varnish sinking in is performed where it could infiltrate the varnish 7 even into the narrow space between the strands of a coil 3 etc. and a stator 1 is covered with the airtight bag 6, since the varnish was infiltrated in the state of reduced pressure, the outflow of a varnish 7 can be prevented.

[0006] However, even if it was in such a sinking-in approach, the room of an improvement was left behind at the following points. That is, if a varnish 7 collect on the slot outlet, its coil, and the section 8 of a stator core 2 and heat hardening be carry out in this condition even if it stick a bag 6 to the inside and outside peripheral surface of a stator 1, as show in drawing 13 , the varnish stuck to the perimeter of a bore side slot outlet of the above-mentioned stator core 2 will serve as an excessive insulating layer, and it will harden, and will also become the cause by which a crack occur by vibration and insulation fall during operation of a dynamo-electric machine. Moreover, in order to remove this, the finishing activity was needed, and the problem which requires most time amount for

this activity is produced.

[0007] Furthermore, as shown in drawing 14, the **** cable line 4 which has the protection section 18 which carries out the braid of the fiber to insulating rubber and a front face, and grows into the terminal section and the front face of a coil 3 on them is connected. If this whole connection is covered with the predetermined insulating material 20 and the above-mentioned varnish is infiltrated in the state of reduced pressure A varnish invades from the terminal section of the insulating material 20 of a connection, the **** cable line 4, and a coil 3, and a varnish takes invasion 21 further from the clearance between the protection section 18 (it changes with rubber) of the **** cable line 4, and core wire 19. Consequently, the varnish 21 which trespassed upon the after [heat hardening] clearance may harden, the **** cable line 4 may lose flexibility, and anchoring may be [the attachment workability of the **** cable line 4 to a terminal block is bad, and] impossible. Moreover, the **** cable line 4 which became hard breaks, and insulation falls. Furthermore, since the **** cable line 4 which became hard is inflexible, along with a coil end, immobilization of it is impossible, and it carries out lifting breakage of the resonance phenomena by vibration of a dynamo-electric machine.

[0008] this invention be made in view of the above-mentioned situation, and both, when [whose place make into the purpose prevent formation of an excessive varnish to a stator core bore side slot outlet in the so-called vacuum packing approach and the degassing approach of perform varnish sink in where a stator be cover with an airtight bag] infiltrate a varnish in the state of reduced pressure further, it offer the varnish sink - in approach of the electrical machinery and apparatus which prevent invasion of a varnish from a **** cable line connection.

[0009]

[Means for Solving the Problem] After the varnish art of the electrical machinery and apparatus of this invention covers the stator which consists of a coil formed in an iron core and this iron core with the bag which has airtightness, The inside of a bag is decompressed, about the sinking-in approach to said stator of this varnish held in the bag in the state of reduced pressure, in front of a wrap, the whole connection of an end-winding tail and a **** cable line is covered with a predetermined insulating material winding and on it, and the insulating material of a self welding property is fixed [the connection] to a bag for said coil object at a coil and the section. Furthermore, insertion immobilization of the insulating paper for varnish antisticking excessive into the slot outlet part by the side of a stator-core bore is carried out, and it has the description at the place which infiltrates into said coil object the varnish held in said bag.

[0010]

[Function] If insertion arrangement of the insulating paper which cuts deeply to a both-ends side and has a slot is carried out while being turned up to a stator core and the inside upper part in a bag, it will be prevented that an excessive varnish infiltrates into an iron core bore slot outlet part. Therefore, fixing of an excessive varnish can be prevented, the insulating layer by the varnish being formed in a need part if the insulating paper is demounted after hardening of a varnish. Moreover, even the core wire of the above-mentioned **** cable line preventing invasion, even if it infiltrates a varnish in the state of said reduced pressure by winding the whole connection part of an end-winding tail and a **** cable line with the insulating material of a self welding property, a varnish comes to be pushed in to a part with the narrow coil inside of the body, and sinking [of a varnish] in is performed effectively.

[0011]

[Example] Hereafter, this invention is explained with reference to drawing 1 thru/or drawing 9 about one example applied to varnish sinking-in processing of the stator of a dynamo-electric machine.

[0012] With reference to drawing 7 thru/or drawing 9, the outline configuration of the stator 1 of an electrical machinery and apparatus is described first. A stator 1 loops a stator core 2 around two or more coils 3, is constituted, by the **** cable line 4 drawn from this coil 3, makes approximate circle annular to the whole, and is formed in it. Among these, by the shape for example, of a ring, a stator core 1 carries out two or more sheet laminating of the thin griddle which carried out two or more ***** of the slot 5 of open type to an inner periphery, and is formed. Moreover, inside this slot 5, as shown in drawing 9, the slot insulation object 11 is equipped.

[0013] On the other hand, said coil 3 uses polyester imide copper wire as a strand 12, winds, is

formed, as plurality shows the predetermined slot 5 at drawing 9, it is held in a vertical bilayer, and the stator core 2 is looped around it in the condition of having been fixed by the wedge 13. Moreover, between the coils of a vertical bilayer, the layer insulation object 14 is inserted within this slot 5. Moreover, as shown in drawing 8, a coil and 8 are orthopedically operated by **** 16, necessary connection between coils 3 is made in this coil and 8, and the **** cable line 4 is further drawn from the terminal section of a coil 3.

[0014] Thus, as varnish sinking-in processing is made by the below-mentioned approach and this shows the constituted stator 1 to drawing 9, the insulating layer 15 by the varnish is formed in the narrow space between strand 12 of a coil 3, and between a coil 3 and a slot 5. By this insulating layer, improvement in the strength in high temperature of a coil 3 or earthquake-proof reinforcement, fixing force strengthening of a stator core 2, and improvement in an insulating property can be aimed at.

[0015] furthermore, since the excessive insulating layer be formed in the part of the iron core bore slot outlet which had become a problem conventionally, it prevent having become the cause of generating of a crack, a varnish invade to the interior of the **** cable line 4, and it be say that the above-mentioned **** cable line 4 carry out hardening breakage with reference to drawing 1 thru/or drawing 4 about the approach of the prevented efficient varnish sink - in processing. The piece section 23 of an insulation into which the cut slot 24 the stator-core 2 laminating part and whose attaching part 25 corresponded went the insulating paper 22 formed in the configuration as shown in drawing 1 is respectively equipped with the inside perimeter of the slot outlet of a stator core 2 in the state of a wrap to the stator 1 first constituted by the stator core 2 by looping around a coil 3.

[0016] Then, as shown in drawing 2, upper limit holds in the opening 6a bag 6 with the airtightness carried out. This bag 6 is formed from supple plastic film, and has the sufficiently bigger die-length dimension which is path size a little than the outer diameter of said stator 1. Where a stator 1 is held, the lower part is turned up to the inside upper part, and a bag 6 (finishing [in drawing 10 / explanation] theoretically) covers a part for the inside-and-outside periphery of a stator 1. At this time, requirements hold of the non-solvent type varnish 7 is carried out into the bag 6.

[0017] The **** cable line 4 which connects with the terminal section 10 of a coil coil and this terminal section 10 by the activity which attaches a **** cable line before this activity as shown in drawing 6 is connected. This connection 11 Between the **** cable line 4 and the end-winding tail 10 is wound around the thickness of homogeneity for for example, the silicone tape or silicone rubber of a self welding property, and a sealing layer is made to form. A predetermined insulating tape is wound around the bottom, and the insulating layer 20 of the whole connection is made to form.

[0018] Above-mentioned drawing 2 is drawing set in this condition, and it equips a coil and 8 periphery sections with an elastic band 9 from bag 6 outside, and it is made for a bag 6 to stick it to a coil and 8. This back, it connects with the decompression device which does not illustrate opening 6a of said bag 6, vacuum suction of the interior of a bag 6 is carried out, and heat hardening is carried out with the heating furnace which heat seals the connection section of opening 6a of a bag 6, and a decompression device, and is not illustrated in the state of reduced pressure in this condition.

[0019] Since the interior of a bag 6 is continuing being decompressed by this as shown in drawing 4, a stator core 2 and a coil 3 will maintain the so-called condition that the vacuum packing was carried out. It can be made to stick in this condition, since it has equipped with the insulating paper 23 which has the cut slot 24 in an elastic band 9 and inner circumference side by the inside-and-outside periphery of the slot outlet of a stator core 2 at a periphery, without an excessive varnish invading. Moreover, since the insulating material of a self welding property is wound around the connection of the **** cable line 4, invasion of a varnish can be prevented in the **** cable line 4.

[0020] Consequently, it becomes possible to enter to the narrow space between strand 12 of a coil 3, and between a coil 3 and a slot 5, the varnish 7 held in the bag 6 preventing [since the stator core 2 and the coil 3 decompress, sink in, and] invasion into the above-mentioned a slot outlet perimeter or the **** cable line 4. It holds in a bag 6 after an appropriate time, the varnish 7 with which it sank in by heating a stator core 1 and a coil 3 with the reduced pressure condition is stiffened, and the stator 1 in which the varnish insulating layer 15 was formed is constituted. In addition, after stiffening a varnish 7, a band 9, a bag 6, and the insulating paper 23 are respectively removed from a stator 1.

[0021]

[Effect of the Invention] According to the varnish sinking-in approach of the electrical machinery and apparatus of this invention, it can perform varnish sinking in, where an iron core and a coil are covered with an airtight bag, and a varnish can be infiltrated to the narrow space between between [of a coil] strands, a coil, or an iron core so that clearly [in the above explanation]. Moreover, formation of the excessive insulating layer produced according to generating of Siwa in a bag etc. can be prevented by sticking an airtight bag to an iron core and a coil. Furthermore, a varnish invades in a **** cable line and it hardens, and it is abolished a fall and that break and insulation also falls [of anchoring workability], and they do the outstanding practical effectiveness so in accordance with removal of the excessive insulating layer needed in the conventional approach becoming unnecessary.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

- [Drawing 1] The top view of the insulating paper in which one example of this invention is shown,
[Drawing 2] The front view in which traveling through a part and showing the condition of having held the coil and the iron core in the bag,
[Drawing 3] The front view expanding, traveling through and showing the coil and the section in the drawing 2 condition,
[Drawing 4] The front view in which traveling through a part and showing the condition of having been stuck to the bag by the stator,
[Drawing 5] The front view expanding, traveling through and showing the coil and the section in the drawing 4 condition,
[Drawing 6] The sectional view showing a part of connection of a **** cable line and an end-winding tail, and insulating condition by vertical section,
[Drawing 7] The perspective view of a stator,
[Drawing 8] A coil and the perspective view of the section,
[Drawing 9] The partial cross-sectional view of a stator,
[Drawing 10] The perspective view showing the cuff principle of the conventional bag,
[Drawing 11] The drawing 4 equivalent Fig. showing the conventional example,
[Drawing 12] The drawing 2 equivalent Fig. showing the conventional example,
[Drawing 13] The drawing 9 equivalent Fig. showing the conventional example,
[Drawing 14] The drawing 6 equivalent Fig. showing the conventional example.

[Description of Notations]

2 -- Stator core 3 -- Coil 4 [6 -- Bag 7 / 23 -- Insulating paper 24 -- The piece section of an insulation, 25 -- Cut slot. / -- A varnish 8 -- Coil end] -- A **** cable line, 5 -- Slot

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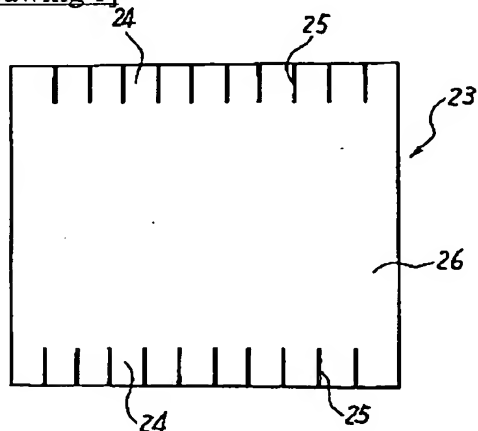
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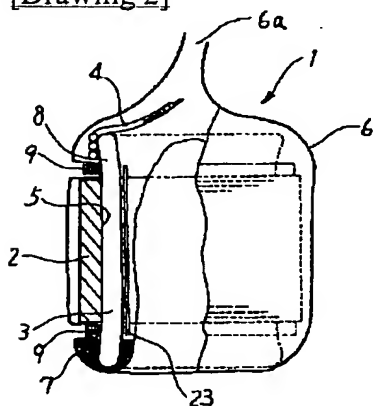
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DRAWINGS

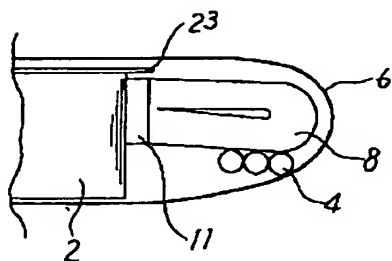
[Drawing 1]



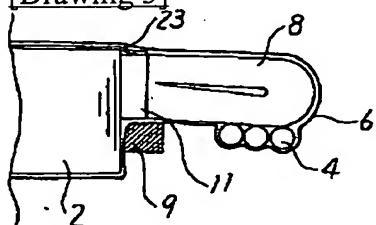
[Drawing 2]



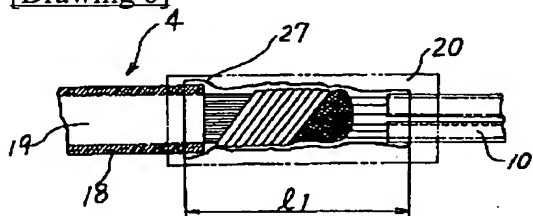
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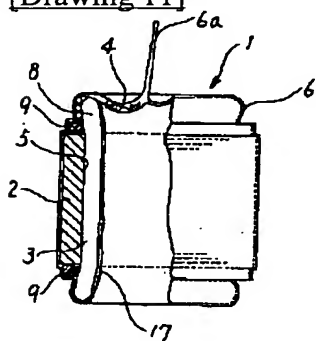
[Drawing 5]



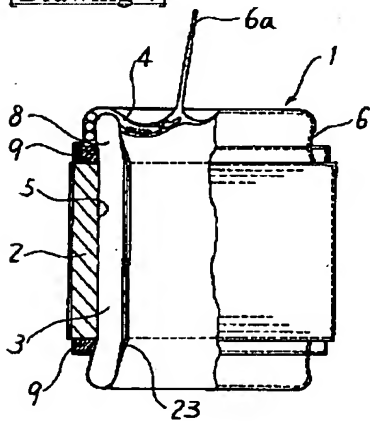
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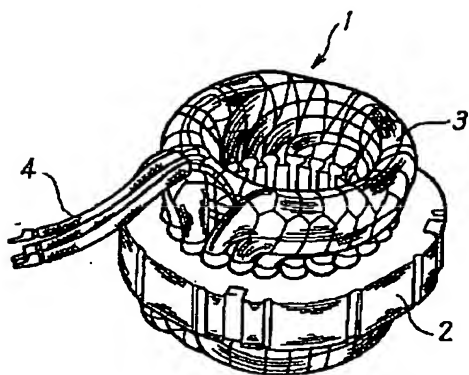
[Drawing 11]



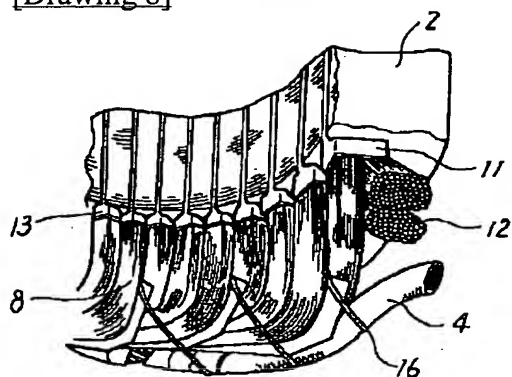
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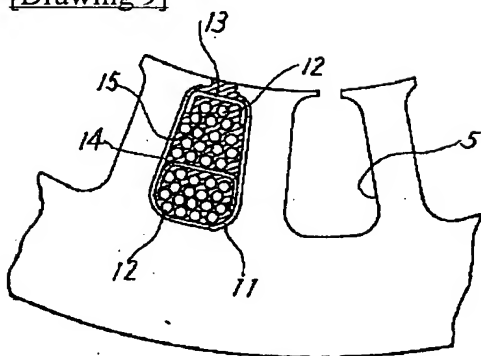
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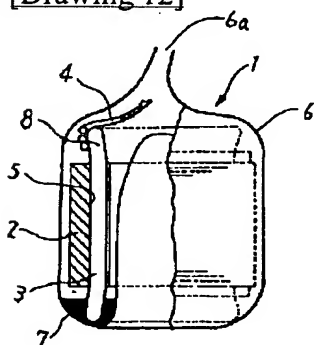
[Drawing 8]



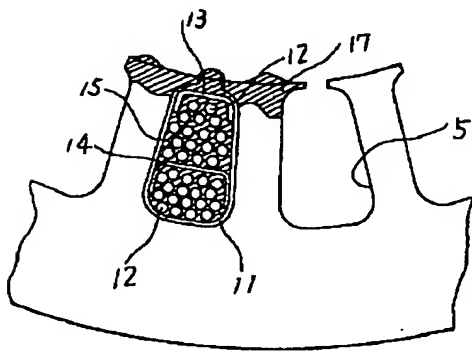
[Drawing 9]



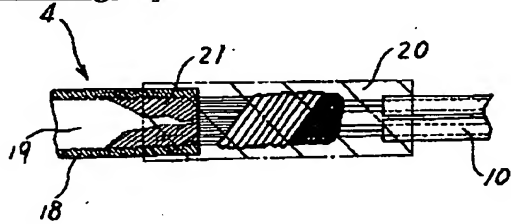
[Drawing 12]



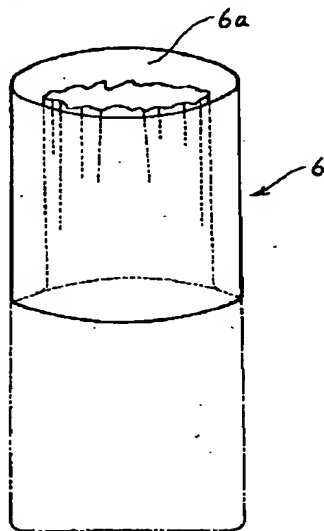
[Drawing 13]



[Drawing 14]



[Drawing 10]



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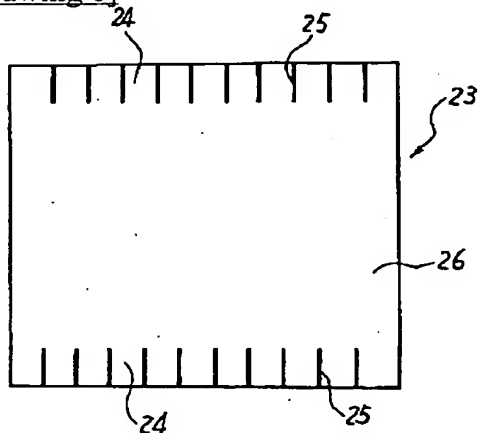
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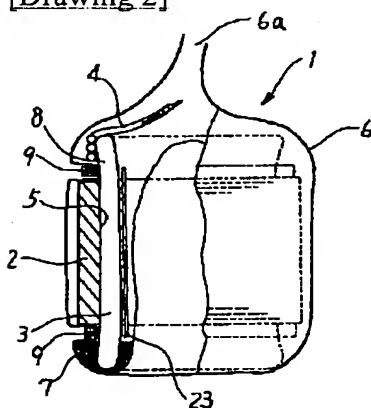
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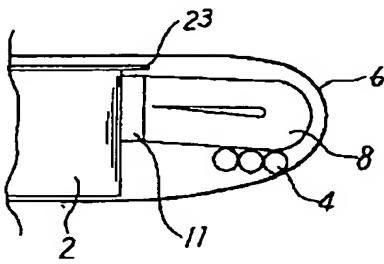
[Drawing 1]



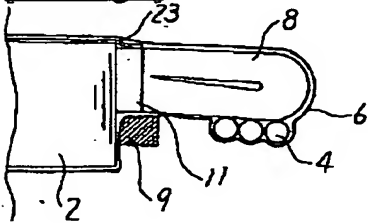
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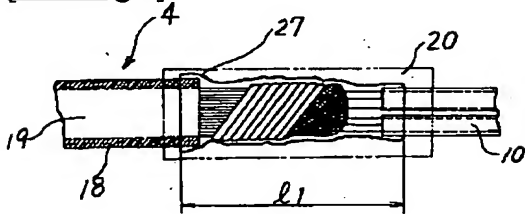
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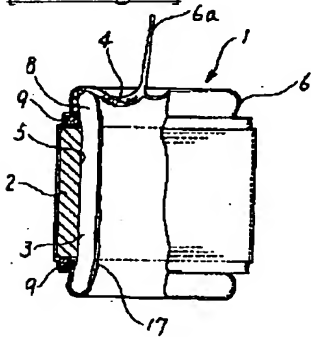
[Drawing 5]



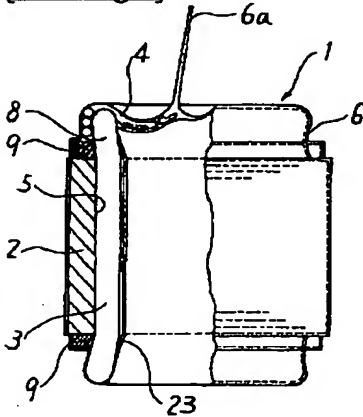
[Drawing 6]



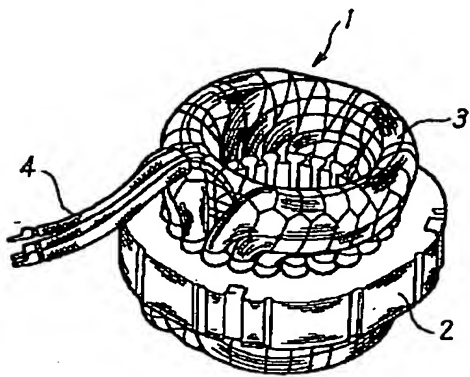
[Drawing 11]



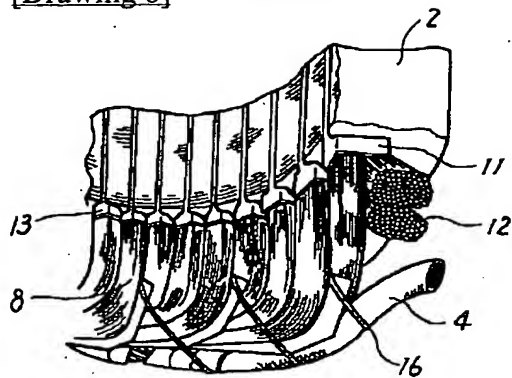
[Drawing 4]



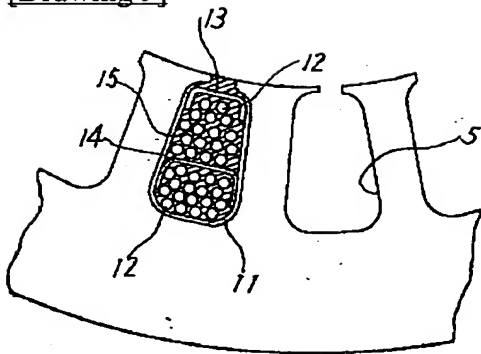
[Drawing 7]



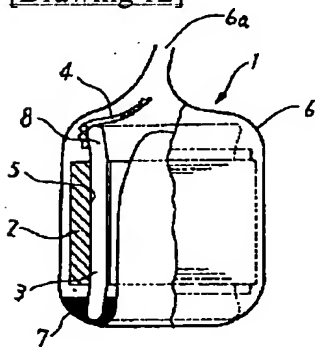
[Drawing 8]



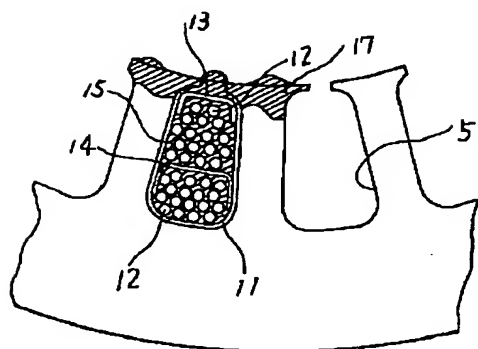
[Drawing 9]



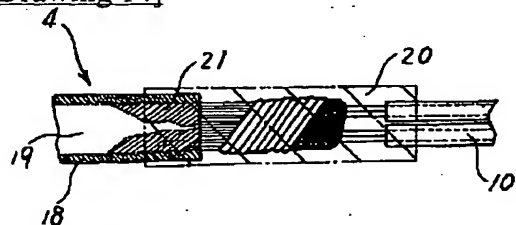
[Drawing 12]



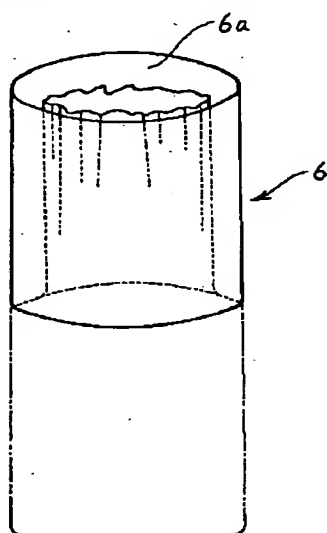
[Drawing 13]



[Drawing 14]



[Drawing 10]



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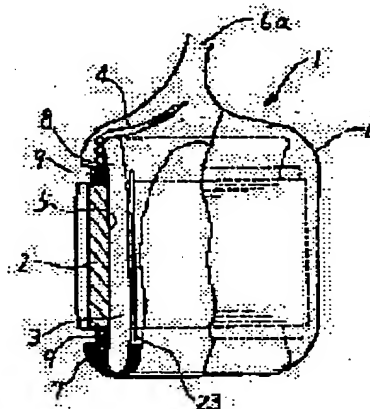
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(54) METHOD FOR IMPREGNATING ELECTRIC APPARATUS WITH VARNISH

(57)Abstract

PURPOSE: To provide the method for impregnating an electric apparatus with varnish, which prevents the formation of extra varnish at the outlet of the slot of a stator core at the inner diameter side and prevents the intrusion of the varnish from the connecting part of a lead cable when the varnish is impregnated in the pressure reduced state in the so-called a vacuum packing method and a degassing method, by which the varnish is impregnated under the state wherein the stator is covered with an airtight bag.

CONSTITUTION: In a method for impregnating an electric apparatus with varnish, a stator comprising an iron core 2 and a winding 3, which is provided on the iron core 2, is covered with an airtight bag 6. Then, the pressure in the bag is reduced. Varnish 7 contained in the bag is made to impregnate into the stator under this pressure reduced state. In this impregnating method, self-fusing and-fixing insulator is wound around the entire connecting part of a coil-end part 8 and a lead cable 4 before the winding body is covered with the bag. Specified insulator is made to cover the upper part thereof and fixed to the coil-end part 8. Insulating paper 23 for preventing the attachment of the extra varnish is inserted and fixed at the slot-outlet part of the stator core 2 on the inner diameter side. The varnish 7 contained in the bag is impregnated into the winding body.



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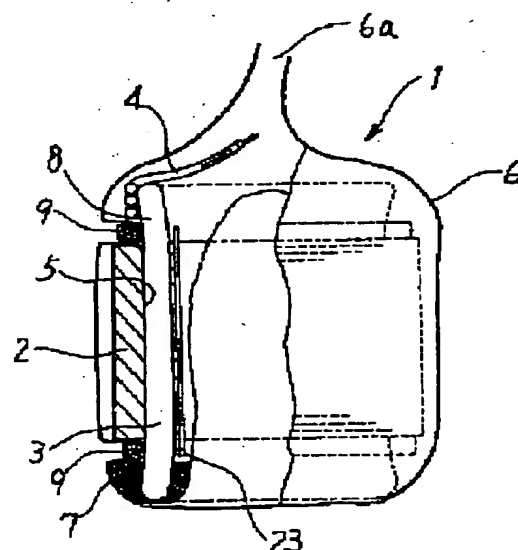
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(54)【発明の名称】 電気機器のワニス含浸方法

(57)【要約】 (修正有)

【目的】 固定子を気密性の袋により覆った状態でワニス含浸を行なう所謂真空バック方法及び脱気方法において、固定子鉄心内径側スロット出口に余分なワニスの形成を防止する共に、更にワニスを減圧状態で含浸させたとき口出ケーブル線接続部よりワニスの侵入を防止する電気機器のワニス含浸方法を提供する。

【構成】 電気機器のワニス処理方法は鉄心2とこの鉄心2に設けられた巻線3とからなる固定子を気密性を有する袋6により覆った後、袋内を減圧し、この減圧状態で袋内に收容したワニス7の前記固定子への含浸方法に関し、巻線体を袋に覆う前に、コイル端末部8と口出ケーブル線4との接続部全体を自己融着性の絶縁物を巻回し、その上に所定の絶縁物で覆ってコイルエンド部8に固定する。更に固定子鉄心2内径側のスロット出口部分に余分なワニス付着防止用絶縁紙23を挿入固定し、袋内に收容したワニス7を巻線体に含浸させる。



【特許請求の範囲】

【請求項1】 鉄心とこの鉄心に設けられた巻線とからなる巻線体を気密性ある袋により覆い、この後その袋内を減圧し、この減圧状態で前記袋内に収容したワニスを前記巻線体に含浸させるようにした方法であって、前記巻線体を袋により覆う前に、前記固定子鉄心内径面と袋内径部間の両端部にワニスに対する剥離性の良い切込溝の入った絶縁片部を有する絶縁紙の絶縁片部を挿入配置し、前記袋が巻線体を覆い袋内を減圧したのち巻線及びスロット内に含浸されたワニスを加熱硬化させ、固定子鉄心両側端面及びスロット出口部にワニスが密着するように形成したことを特徴とする電気機器のワニス含浸方法。

【請求項2】 コイル端末部と口出ケーブル線との接続部全体を自己融着性の絶縁物を巻回し、その上に所定の絶縁物で覆って含浸処理する請求項1記載の電気機器のワニス含浸方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、回転電機の固定子鉄心の巻線体に対するワニス処理の方法を改良した電気機器のワニス含浸方法に関する。

【0002】

【従来の技術】 電気機器、例えば回転電機においては、鉄心に巻線を巻装してなる固定子ワニス含浸処理を施し、固定子の絶縁性、耐熱性の向上や、強度の向上などを図ることが行なわれている。この種のワニス含浸処理方法として従来では、固定子を熱硬化性樹脂からなるワニスに浸漬後、その固定子を加熱炉に収容しワニスを加熱硬化させる浸漬法や、固定子に対してワニスを滴下させて含浸させる滴下含浸法などが用いられていた。

【0003】 しかし、これらの含浸方法では巻線の素線間や巻線とスロット間などの狭小な部分にワニスが含まれにくく、しかも一旦含浸されたワニスが固定子より流出することにあるといった欠点があった。この問題を解決するため、従来のワニス含浸方法に代わる方法にして固定子を気密性のある袋により覆い、この袋内にワニスを収容後に袋内を減圧した状態で、袋内のワニスを固定子に含浸する方法を開発し、特願平2-231051号にて出願している。この方法について図10乃至図14を参照して以下に述べる。

【0004】 回転電機の固定子1は固定子鉄心2に巻線3を巻装して構成されており、図10に示す気密性を有する円筒状の袋10を内側上方に折り返すことにより、固定子1の内外周が図12に示す如く覆われるようにして収容すると共に、その袋6内に所要量のワニス7を収容しておく。かかる後、前記袋6の開口部を真空ポンプに接続して袋6内の内部を減圧することにより、図11に示すように袋6を固定子1の内外周面に密着させて、内部のワニス7を固定子1に含浸させる。この後、固定

子1を袋6より覆った状態で加熱炉内にて加熱し、ワニス7を硬化させるものである。

【0005】

【発明が解決しようとする課題】 前述した方法によれば、減圧状態にてワニスを含浸させることができるので、ワニス7を巻線3の素線間などの狭い空間にまで含浸させることができ、又固定子1が気密性の袋6により覆われた状態にてワニス含浸が行なわれるので、ワニス7の流出を防止できる。

【0006】 しかしながら、このような含浸方法にあっても、次のような点で改善の余地が残されていた。即ち図13に示すように袋6を固定子1の内外周面に密着させても固定子鉄心2のスロット出口とそのコイルエンド部8にワニス7が溜まり、この状態で加熱硬化させると、前述の固定子鉄心2の内径側スロット出口周囲に密着したワニスが余分な絶縁層となって硬化し、回転電機の運転中に振動によりクラックが発生し絶縁性が低下する原因ともなる。又これを除去するためには仕上げ作業が必要となり、この作業にかなりの時間がかかる問題を生じている。

【0007】 更に図14に示すように、巻線3の端末部と表面に絶縁ゴム及び表面に繊維を編組して成る保護部18を有する口出ケーブル線4とを接続して、この接続部全体を所定の絶縁物20で覆い、前述のワニスを減圧状態で含浸させると、接続部の絶縁物20と口出ケーブル線4及び巻線3の端末部よりワニスが侵入し、口出ケーブル線4の保護部18（ゴムで成る）と心線19との隙間よりさらにワニスが侵入21する。この結果、加熱硬化後隙間に侵入したワニス21が硬化して口出ケーブル線4が柔軟性を失い、端子台への口出ケーブル線4の取付作業性が悪く取付けができないこともある。又硬くなった口出ケーブル線4が折れて絶縁性が低下する。更に硬くなった口出ケーブル線4は柔軟性がないため、コイルエンドに沿って固定ができず、回転電機の振動で共振現象を起こし破損する。

【0008】 本発明は、上記事情に鑑みなされたものであり、その目的とする所は固定子を気密性の袋により覆った状態でワニス含浸を行なう、所謂真空バック方法及び脱気方法において、固定子鉄心内径側スロット出口に余分なワニスの形成を防止する共に、更にワニスを減圧状態で含浸させたとき口出ケーブル線接続部よりワニスの侵入を防止する電気機器のワニス含浸方法を提供する。

【0009】

【課題を解決するための手段】 本発明の電気機器のワニス処理方法は鉄心とこの鉄心に設けられた巻線とからなる固定子を気密性を有する袋により覆った後、袋内を減圧し、この減圧状態で袋内に収容したワニスの前記固定子への含浸方法に関し、前記巻線体を袋に覆う前に、コイル端末部と口出ケーブル線との接続部全体を自己融着

性の絶縁物を巻回し、その上に所定の絶縁物で覆ってコイルエンド部に固定する。更に固定子鉄心内径側のスロット出口部分に余分なワニス付着防止用絶縁紙を挿入固定し、前記袋内に収容したワニスを前記巻線体に含浸させるところに特徴を有する。

【0010】

【作用】固定子鉄心と袋の内側上方へ折り返された間に両端面に切り込み溝のある絶縁紙を挿入配置しておけば、鉄心内径スロット出口部分に余分なワニスが入ることが阻止される。従ってワニスの硬化後にその絶縁紙を取外せば、必要部分にはワニスによる絶縁層が形成されつつ、余分なワニスの固着を防止できる。また、コイル末端部と口出ケーブル線との接続部分全体を自己融着性の絶縁物で巻回することによって、前記減圧状態でワニスを含浸させても前述口出ケーブル線の心線まで侵入の防止をしつつ、ワニスが巻線体内の狭い部分まで押し込まれるようになりワニスの含浸が効果的に行なわれる。

【0011】

【実施例】以下、本発明を回転電機の固定子のワニス含浸処理に適用した一実施例について図1乃至図9を参照して説明する。

【0012】まず図7乃至図9を参照して電気機器の固定子1の概略構成について述べる。固定子1は固定子鉄心2に複数個の巻線3を巻装して構成され、この巻線3より導出された口出ケーブル線4で全体に略円環状をなして形成されている。このうち固定子鉄心1は例えばリング状で内円周に開放形のスロット5を複数固穿設した薄鉄板を複数枚積層して形成されている。又、このスロット5の内側には図9に示すようにスロット絶縁物11が装置されている。

【0013】一方前記巻線3はポリエステルイミド銅線を素線12とし巻回して形成され、複数個が所定スロット5に図9に示すように上下二層に収容され、楔13により固定された状態で固定子鉄心2に巻装されている。又、このスロット5内にて上下二層の巻線の間には層間絶縁物14が挿入されている。又、図8に示すようにコイルエンド8は縛糸16により整形されており、このコイルエンド8にて巻線3間の所要の接続がされ、さらに巻線3の末端部からは口出ケーブル線4が導出されている。

【0014】このように構成された固定子1は後述方法でワニス含浸処理がなされ、これにより図9に示すように巻線3の素線12同士間及び巻線3とスロット5間の狭い空間にワニスによる絶縁層15が形成されるようになっている。この絶縁層により、巻線3の耐熱強度や耐震強度の向上、固定子鉄心2の固着力強化、絶縁特性の向上を図ることができる。

【0015】更に従来問題となっていた鉄心内径スロット出口の部分に余分な絶縁層が形成されたために、クラ

ックの発生原因となっていたことを防止し、ワニスが口出ケーブル線4の内部まで侵入して、前述口出ケーブル線4が硬化破損することを防止した効率的なワニス含浸処理の方法について図1乃至図4を参照して述べる。まず固定子鉄心2に巻線3を巻装して構成された固定子1に対して、図1に示すような形状に形成された絶縁紙22を、固定子鉄心2積層部分と保持部25が一致した切込溝24の入った絶縁片部23を各々固定子鉄心2のスロット出口の内面全周を覆う状態にて装着する。

10 【0016】その後、図2に示すように、上端が開口6aした気密性のある袋6内に収容する。この袋6は、例えば柔軟性のあるプラスチックフィルムから形成され、前記固定子1の外径よりも若干径大で、かつ十分大きな長さ寸法を有している。固定子1が収容された状態では、袋6（図10で原理的に説明済）はその下部が内側上方へ折返されて固定子1の内外周部分を覆うようになっている。このとき、袋6内に例えば無溶剤タイプのワニス7を所要量収容しておく。

20 【0017】この作業以前に口出ケーブル線を取付ける作業で、図6に示すように巻線コイルの末端部10と、この末端部10と接続する口出ケーブル線4とを接続する。この接続部11に自己融着性の例えばシリコンテープ或いはシリコンラバーを口出ケーブル線4とコイル末端部10間を均一の厚さに巻回してシール層を形成させる。その上側に所定の絶縁テープを巻回して接続部全体の絶縁層20を形成させる。

30 【0018】前述の図2は、この状態でセットされた図であり、コイルエンド8外周部にはゴムバンド9を袋6外側より装置して袋6がコイルエンド8に密着するようになる。かかる後、前記袋6の開口部6aを図示しない減圧装置に連結して袋6の内部を真空引きし、この状態で袋6の開口部6aと減圧装置との連結部とをヒートシールして減圧状態にて図示しない加熱炉にて加熱硬化させる。

40 【0019】これにより、図4に示すように袋6の内部が減圧され続けているため、固定子鉄心2及び巻線3は所謂真空パックされた状態を保つことになる。この状態において、固定子鉄心2のスロット出口の内外周で外周にはゴムバンド9、内周側には切込溝24のある絶縁紙23が装着してあるため、余分なワニスが入ることなく密着させることができる。又、口出ケーブル線4の接続部には自己融着性の絶縁物が巻回してあるため、口出ケーブル線4の中にワニスの侵入を防止できる。

50 【0020】その結果、袋6内に収容されているワニス7は固定子鉄心2及び巻線3に減圧されているため含浸され、前述のスロット出口周囲や口出ケーブル線4の中までの侵入を防止しつつ、巻線3の素線12同士間や巻線3とスロット5間の狭い空間まで入り込むことが可能となる。しかる後袋6内に収容し、減圧状態のまま固定子鉄心1及び巻線3を加熱して含浸されたワニス7を

5

硬化させ、ワニス絶縁層15が形成された固定子1が構成されるものである。尚、ワニス7を硬化させた後にはバンド9、袋6、絶縁紙23は各々固定子1より取り外される。

【0021】

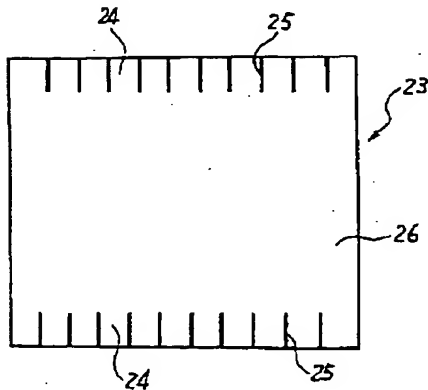
【発明の効果】以上の説明にて明かなように、本発明の電気機器のワニス含浸方法によれば、鉄心及び巻線を気密性の袋により覆った状態でワニス含浸を行ない、巻線の素線間同士や巻線と鉄心間の狭い空間までワニスを含浸させることができる。また、気密性の袋を鉄心及び巻線に密着させることにより袋のシワ等の発生により生じる余分な絶縁層の形成を防止することができる。更に口出ケーブル線内にワニスが侵入し硬化してしまつて取付け作業性の低下や折れて絶縁性が低下することも廃止され、従来方法において必要とされていた余分な絶縁層の除去作業が不要となることとあわせ、優れた実用的効果を奏するものである。

【図面の簡単な説明】

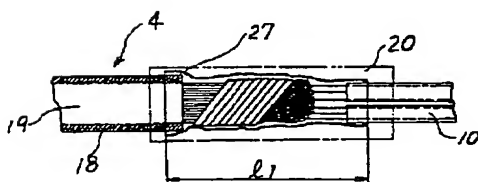
【図1】本発明の一実施例を示す絶縁紙の平面図、

【図2】巻線及び鉄心を袋内に收容した状態を一部を縦断して示す正面図、

【図1】



【図6】



6

【図3】図2状態でのコイルエンド部を拡大して縦断して示す正面図、

【図4】袋が固定子に密着された状態を一部を縦断して示す正面図、

【図5】図4状態でのコイルエンド部を拡大して縦断して示す正面図、

【図6】口出ケーブル線とコイル端末部の接続、絶縁状態を一部縦断で示す断面図、

【図7】固定子の斜視図、

【図8】コイルエンド部の斜視図、

【図9】固定子の部分的な横断面図、

【図10】従来の袋の折返し原理を示す斜視図、

【図11】従来例を示す図4相当図、

【図12】従来例を示す図2相当図、

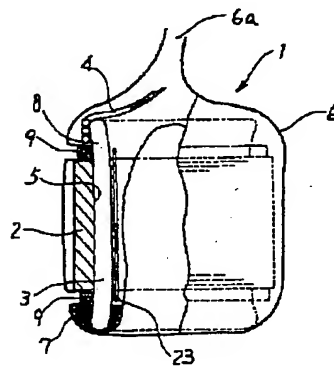
【図13】従来例を示す図9相当図、

【図14】従来例を示す図6相当図。

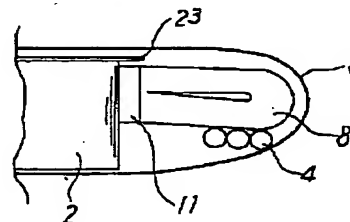
【符号の説明】

2…固定子鉄心、 3…巻線、 4…口出ケーブル線、 5…スロット、 6…袋、 7…ワニス、 8…コイルエンド、 23…絶縁紙、 24…絶縁片部、 25…切込溝。

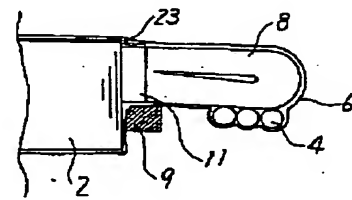
【図2】



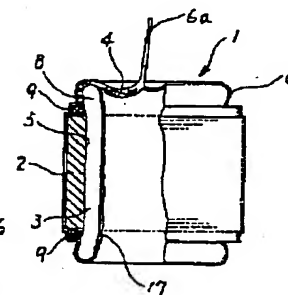
【図3】



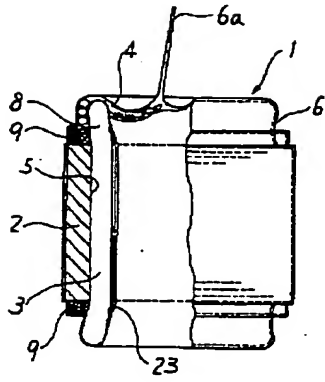
【図5】



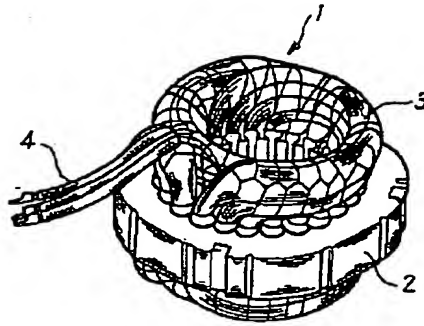
【図11】



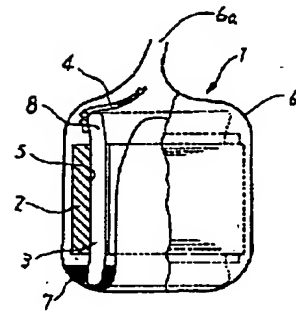
【図4】



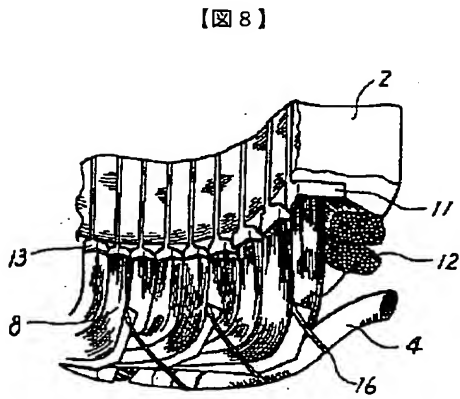
【図7】



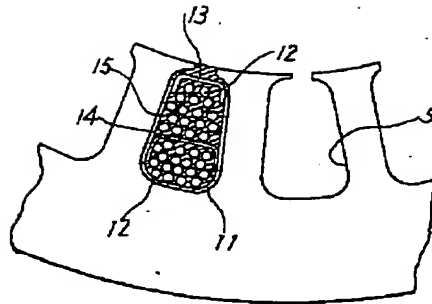
【図12】



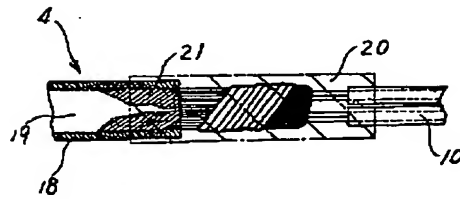
【図9】



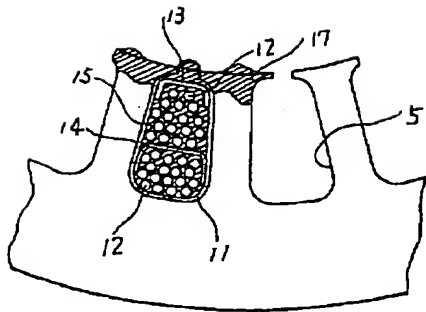
【図8】



【図14】



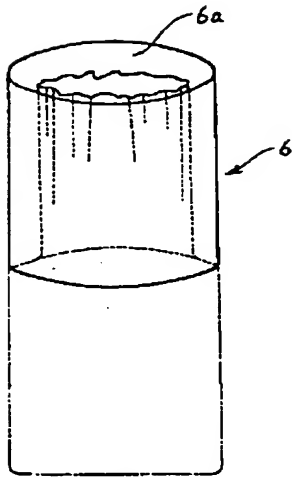
【図13】



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【図10】



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